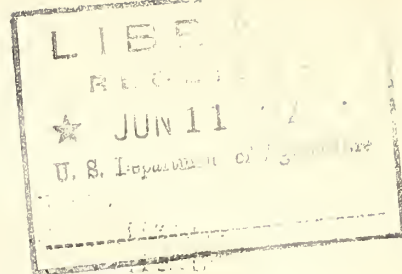


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GREETINGS, AND WORKINGS OF THE
BUREAU OF BIOLOGICAL SURVEY.



An address by W. C. Henderson, Associate Chief of the Bureau of Biological Survey, United States Department of Agriculture, before the Minnesota Council of the Izaak Walton League of America at the State Convention, held at Crookston, Minn., June 2, 1932

I am glad to be able to take some part in the deliberations of the Minnesota Division of the Izaak Walton League of America, a division that occupies such a prominent place in the ranks of that great organization dedicated to the conservation of the natural resources of our country. If our lakes and streams, our forests and parks, and the living creatures that inhabit them, are to continue to be enjoyed, it will be because of the unselfish devotion and the intelligent and united action of all nature lovers and conservationists. Never was the need for coordinated action greater than at present, never was the call to service stronger.

In the economic development of the country, agriculture and industry have emphasized immediate returns instead of giving due consideration to the future. The habitats of our wild creatures of field and forest have been taken, and their numbers diminished. Aquatic life has been destroyed as streams have been polluted by sewage and industrial waste, and filled with silt by erosion. Concurrently the numbers of hunters and fishermen have increased, and access to hunting and fishing grounds has been made easy.

But although the situation is bad, it is not altogether hopeless. The Izaak Walton League and other great organizations of far-seeing men and women are showing the way to better conditions. Interest in the great out-of-doors is increasing, and literally millions of nature lovers are ready to respond to wise leadership. Once united, they will constitute a force sufficient to overwhelm all selfish interests, and to demand the conservation of our wild life for future generations.

In all movements for the conservation of our wild animals and birds the Biological Survey, with its great store of scientific data, will continue to play a prominent part. Nearly half a century ago this bureau had its beginning in what was then the Division of Entomology, when an appropriation was made for the purpose of conducting a study of "economic ornithology, or the study of the interrelation of birds and agriculture." Later its field was expanded to include scientific investigations of mammals, reptiles, and amphibians, and the scope of its work was broadened to cover wild-life conservation, including game protection. Its duties at present may be grouped under the three heads of research, control, and conservation.

Research Work

The research of the Biological Survey includes the study of the distribution, migratory movements, and ecology of birds and other animals and their consequent economic relationships. Fifty years ago little was known concerning the fauna of much of North America. As the result of the field investigations of the bureau, hundreds of species new to science have been described and their distribution and economic status have been determined. Through the painstaking care of scientifically trained men in the field and in the laboratory, the food habits of a very large number of our birds and other animals have been learned and their economic importance established.

Most wild creatures are either harmless or beneficial to man's interests. A few have been found harmful under certain conditions, as a rule locally. Some of the so-called predatory species in settled communities and in stock-raising regions are seriously destructive to livestock and poultry. Rodents in many places destroy the farmer's crops or the forage on "the range." In some places a small number of birds take too heavy a toll of fruit or other products of the farm. Sometimes birds occur in such numbers that they wreak havoc with the crop.

It has been the aim of the Biological Survey to ascertain and publish the truth about the food habits of our birds and mammals, in order that wild life protection might be based on its economic importance as well as its esthetic interest. Particularly in the case of birds we have usually been able to show that damage to crops was not the work of a large number of species but of a few particular ones. Thus the control measures recommended have been directed to the offending birds, and the harmless and valuable species have been spared and protected.

Our program of research includes investigations of the wild life and its relationships in forest areas. This is a broadly-conceived long-time program of research of distinct interest and importance to the membership of the Izaak Walton League. It should disclose the intimate and baffling secrets of nature that lie at the very foundations of efforts to improve wild-life conditions and recreational opportunities in America. The period has passed when we may draw thoughtlessly upon nature's vast store of wild-life resources accumulated during the untold ages when natural forces held sway, little affected by human influence. We are now in an era when intelligence and restraint must bear their fair share of the burden of maintaining and restoring conditions favorable to wild-life interests. These have been and should continue to be a stimulus to the mental and physical stamina and the resourcefulness of our people through coming generations. Reliable information and sane, practical interpretation of its meaning, coupled with prompt, vigorous application of the findings, must be the basis of future endeavors in the fields of wild-life maintenance and use.

Plans for the Biological Survey to conduct a program of forest-fauna investigation were authorized by Congress in the McSweeney-McNary Act. In this work the Survey cooperates with the Forest Service and other bureaus in the department, and with universities, agricultural colleges, and other research agencies. In Minnesota the work is associated with the Agricultural College of the University of Minnesota, with headquarters at the Lake States Forest Experiment Station. Cooperation is close with Forest Service workers, with scientists in the University of Minnesota, and with the State Conservation Commission.

Within the purview of the forest research program come all the birds, mammals, reptiles and amphibians, and insects that inhabit forested areas. Efforts are being made by the Biological Survey to establish a sound ground-work of biological fact regarding the occurrence of the vertebrate species, their life histories and seasonal movements, and their effect upon one another and upon forest growth. Special attention is given to seed-eating rodents and birds, to determine the extent to which they may interfere with natural or artificial planting of seeds of forest trees. Methods of planting and protection, and of supplemental feeding in critical periods, are studied with a view to remedying any trouble that may be observed and still permitting the maintenance of normal populations of the interesting wild life. Special attention also is given to the game and fur-bearing species, which constitute a natural asset, the growing and proper harvesting of which may add to the productive values of the land.

In the past too little attention has been given to the value of wild-life resources as a profitable adjunct of land utilization. This has resulted in the destruction on a vast scale of valuable areas of marsh lands through unwise drainage, and the consequent destruction of the wild species without regard to their economic, recreational, or inspirational values.

Looking to the future, we must prepare for constructive thought and action in order to regain the ground lost through thoughtless exploitation of natural resources. Only in this way can we provide for a permanently sustained and properly balanced wild-life population for its own sake, and one that may contribute its full measure to human enjoyment and well-being. The fundamental research of the wild life of the forest is designed to provide information and interpretations that may serve to guide our course along sound and progressive lines.

For the past five years the Biological Survey, in cooperation with the University of Minnesota, has conducted investigations of the diseases that are responsible for the reduced abundance of fur animals and other wild species. There is a strong probability that tularemia and other diseases influence greatly the local abundance of wild life, and that they may be responsible for the cycles of abundance and scarcity especially noted in ruffed grouse, rabbits, and some other species.

These studies are being continued both in Minnesota and other parts of the country. In Minnesota a special method of investigation is made possible through cooperation with the State University, whereby definite areas of woodland will be set aside for observations of the natural course of diseases from onset to conclusion. As a result more practical policies of game management will be possible.

Control

More than twenty years ago Congress placed upon the Survey the duty of cooperating with States, counties, associations, and individuals in the control of mammals found to be destructive locally to man's crops and domestic animals. At first, rodents only were considered, but later appropriations were made for campaigns against predatory animals also. This work was done efficiently, and was appreciated by the farmers and stockmen, and through their demands upon Congress it has greatly increased.

In carrying out this work the Biological Survey has never lost sight of the fact that its main purpose is the conservation of all forms of wild life, except where locally causing serious economic losses. The Survey endeavors to confine control work to the harmful species, and in this effort it is in the main successful. It is inevitable, though deplorable, that notwithstanding every precaution a relatively small number of harmless animals are killed by trap and poison. This incidental destruction, however, has never had an appreciable effect upon the relative abundance of any species. That this is true can be observed by anyone who will go into the field and investigate our work.

The bureau has never carried on any extensive campaigns against birds. We have made field studies to learn which species are doing harm locally, and to devise means of destroying the birds responsible for the losses without harming other species in the vicinity. Thereafter the application of these methods is left for the States, counties, or individuals concerned.

In the difficult task of controlling injurious mammals the bureau has not escaped criticism. Some of it has been constructive, and as a result, the bureau has been able to improve its methods. Some good people, however, moved by their love for wild life and inspired with a commendable zeal for its conservation, but not understanding the reasons that have led the bureau to take one course of action or to refrain from taking another, and having imperfect knowledge of the facts, have been misled by exaggerated statements, half truths, and misrepresentations, as well as by their own deductions from false premises. The result has been a series of unwarranted attacks and scathing denunciations.

The motives of the bureau's personnel have been impugned, and they have been pictured as ruthless killers, with a lust to destroy every living creature. The very extravagance of the statements of some of the critics which are so at variance with the known facts, will

doubtless prevent their general acceptance by the public. Some do believe them, however, and to people who have devoted their lives to the cause of wild-life conservation, it is discouraging to be the object of such attacks. It is extremely unfortunate just at this time that the standing of the bureau and its influence for conservation should be thus weakened in any degree.

Conservation through Restrictions on Hunting

The conservation work of the Biological Survey concerns the administration of Federal laws enacted for the protection of wild-animal life. These include the Alaska game law (enforced in Alaska by the Alaska Game Commission), which relates to the birds and land mammals of the Territory of Alaska; the Lacey Act of 1900, which regulates the importation into the United States of birds and other animals, and prohibits the illegal interstate shipment of the dead bodies of birds or animals; and, what are perhaps of more interest at the present time, the migratory-bird treaty act, which was passed in 1918 to put into effect the treaty of 1916 between Great Britain and the United States for the protection of the birds that migrate between Canada and this country; and the migratory-bird conservation act of 1929, which authorizes the acquisition and maintenance of inviolate game-bird refuges.

Under the migratory-bird treaty act the Secretary of Agriculture has the power to make regulations governing the hunting of our migratory game birds. These regulations, when approved by the President, have the effect of law. The migratory-bird treaty act was passed in 1918, and since that time the various regulations that have resulted have afforded the birds much needed protection. Shooting in spring was stopped. It was made illegal throughout the United States to sell migratory wild fowl. Bag limits have been established, and the taking of wild fowl has been restricted in various other ways. During recent years, however, in spite of these protective measures, it has been apparent that our ducks and geese were not holding their own. This has been the result of a variety of circumstances, including overshooting, drainage, and the prevalence of drought during the past few years.

Those in position to see the broad picture of waterfowl over the whole country needed no reports of severe drought in the breeding grounds to convince them that for years these birds have been gradually dwindling in numbers. The drought, however, which has struck heavily at the heart of the breeding area for the past three seasons, was a menace ~~xxxxxxxx~~ so spectacular as to be easily comprehended by the hunters. Now that they at last realize that the waterfowl supply is threatened, sportsmen should be able to review and envision the entire situation and heed the portents of destruction. A game supply that is affected by such a multiplicity of adverse conditions as are the waterfowl can not, but diminish. When such a dwindling stock is pitted against a steadily increasing number of gunners, no prophet is needed to predict the result. Unless remedial action is taken, that result is sure to be the virtual extinction of some of our finest species.

It is certain, however, that there is no true sportsman who would do aught to hasten such extinction, or who would refuse to make sacrifices to prevent it. In full confidence that such a spirit existed and that corrective action would have public support, the Federal authorities decided to reduce the open season on waterfowl during the year 1931 to one month. Action giving the birds some relief was imperative; whether the step taken was sufficient, or whether even more drastic measures may be necessary, only time and experience can tell. The short season on waterfowl was declared because information showed that the birds were confronted by a vital emergency, and it was fully justified.

To those who criticize restrictions, it must be said that in case of need the most direct method of conserving game is to reduce the kill. Restrictions (such as closing the seasons) give the quickest results, and often may be indispensable to prevent the extermination of species.

Conservation through Establishment of Refuges

It was in February, 1929, that Congress, sufficiently impressed with the needs for a national system of Federal migratory-bird refuges, enacted the Norbeck-Andresen migratory-bird-refuge bill, known as the migratory-bird conservation act. By its terms a ten-year program of refuge acquisition, involving expenditures of \$7,875,000, was authorized. Prior to this, however, or in 1925, after a vigorous campaign had been waged by the Izaak Walton League of America and other sportsmen's associations, the Upper Mississippi River Wild Life and Fish Refuge was authorized. Funds were made available for the acquisition of the necessary lands for about 300 miles on either side of the Mississippi, from Wabasha, Minn., to Rock Island, Ill. This area, including lands along that stream in the four States of Minnesota, Iowa, Illinois, and Wisconsin, thus became the first great refuge under Federal control in the tremendous stretch of country that extends from the Atlantic seaboard to and including the Mississippi Valley. Minnesota is fortunate in being able to participate in the benefits accruing from these efforts of the Izaak Walton League, and of others interested in the preservation of our wild-fowl resources.

Beginning in 1917, a survey of marsh and aquatic vegetation of more than 600 of Minnesota's lakes and marsh areas was undertaken by the Biological Survey, to determine the quality and quantity of waterfowl food and cover in the State. This work was carried on by various field parties during ten seasons, the latest in 1930. The areas surveyed are scattered throughout the State and include the majority of the best duck lakes. A report on these investigations is now being prepared and will be published when funds become available for the purpose.

Waterfowl food and cover are still abundant in these lake areas. Waterfowl are likewise ordinarily abundant during migration, but they nest sparingly now where once they nested commonly, Minnesota having been formerly one of the best breeding areas on the continent. The encroachment of agriculture is largely responsible for this diminution

in their nesting. Original prairie vegetation has been destroyed and with it has gone much nesting cover, and many lakes and marshes have been drained. Furthermore, drainage in anticipation of agricultural development, or purely for speculation, has been carried on past all reason. Much of the land once useful to wild life is now ruined for it, and because of lack of any need, because of inaccessibility, of infertile soil, or of incomplete drainage, this is not being utilized for agriculture.

In the lake and marsh areas remaining in the State, conditions also have greatly changed. Several of the best breeding areas were shallow marshy lakes that already have been drained. Cultivation of the land and, in the eastern part of the State, cutting of the forest have affected the water supply and the run-off to the extent that lake levels probably fluctuate seasonally much more than formerly. A strong fluctuation in water level is detrimental to the development of vegetation. In places waters have been badly polluted by town or farm sewage, and growth of vegetation has been restricted thereby. Introduced carp seem to have been responsible for destroying the duck-food plants in many of the lakes in the southeastern part of the State. Resort development, with its attendant fishing, boating, and hunting activities, also is an important factor in the destruction of lake vegetation and of wild life generally.

In the course of the survey of the lakes, information was obtained on which was based, in part, recommendations, for the establishment of the waterfowl refuges in Minnesota contemplated for acquisition under the terms of the Norbeck-Andresen Act of 1929. The funds appropriated for the first year's operations under this act, amounting to \$75,000, were used for a thorough canvass of refuge opportunities in the 48 States, and it was then that the two outstanding opportunities in Minnesota were studied--Thief and Mud Lakes. It was also during the period of these investigations that the Biological Survey learned of plans being formulated in Minnesota to make a State refuge and public shooting ground of Thief Lake.

Restoration to something approaching its former condition is contemplated for Mud Lake, once a famous resort for our wild fowl. Such a course however, is more difficult, than in the case of Thief Lake, for the reason that reflooding will be expensive and it will possibly involve a partial flooding of reclaimed and cultivated lands to the east. If restored as completely as possible, Mud Lake, once one of the outstanding waterfowl sections of the country, may again become a good breeding area.

Preliminary investigations of the Mud Lake region by the Biological Survey disclosed that some 20,000 to 25,000 acres should be acquired to restore former conditions, and that it would be necessary to execute engineering work for the retention of water on the old lake bed. Such modifications in the existing physical conditions would obviously affect the water-table underlying contiguous lands, and bring about pronounced changes in the surface drainage.

Since such restoration development would involve the expenditure of large sums of money for acquisition and development work, and as our budget for the nation-wide system of refuges must be balanced with due regard to the numerous projects in hand, an engineering study was made of Mud Lake. During the past winter the conclusion was reached that such restoration was feasible. The project was therefore listed as one to be given favorable consideration. The restoration during this year of this once famous habitat of wild waterfowl was considered, our hopes being based on the availability of money authorized in the Norbeck-Andresen Act, which would have amounted to \$1,000,000 for the year. This ambition, unfortunately, has been blasted by reason of the necessary retrenchment in governmental appropriations, and it is with keen disappointment that we have had to hold this project in abeyance, together with numerous others throughout the country, until a more propitious time.

It seems appropriate, even at the risk of being somewhat burdensome, to remind this gathering that the problem of acquiring lands for refuges is in all cases a tedious procedure. The Federal Government is meticulous in its consideration of the titles to lands, and it has already been determined that the title status to the lands in the Mud Lake region is so seriously complicated by reason of the drainage district's tax delinquencies and other related incumbrances that the land could not be acquired by the United States without condemnation proceedings in the Federal courts.

Another handicap under which we must work in such circumstances is that condemnation suits can not be instituted without having the money in hand with which to pay for the land involved. As the appropriations under the Norbeck-Andresen Act are yearly, and as the amounts made available have fallen below the sums authorized, we find ourselves placed under such serious financial limitations that the lands here can not be taken now. Moreover, it is impossible for the United States to develop areas along the lines that would be necessary at Mud Lake unless the fee simple title to the lands embraced by the undertaking were vested in the United States. Therefore, though we should like to do so, we can not now proceed with development work.

Investigations throughout the country thus far have covered in all essential details more than 120 refuge sites, distributed among the 48 States, and embracing considerably more than 3,500,000 acres. Investigative work along the same lines is still being continued, but in a very much more restricted form than during the first year's operations. It is unlikely that at the conclusion of the current fiscal year many additional sites suitable for refuge purposes will be added to the list. The cost for such investigations, however, has amounted to less than 3 cents an acre.

The Biological Survey has held that for the refuge program to work out successfully it is incumbent upon the Government to establish refuge areas each containing from 20,000 to 50,000 acres, strategically located throughout the important breeding and wintering grounds and

along the principal migratory waterfowl flight lanes, and of such character as to be attractive to migratory birds. The attractions of these areas should preferably be natural ones, but it is recognized that much can be done to enhance their usefulness by development work. Such development should be designed to impound large areas of water, to increase the natural food supply by the propagation and introduction of aquatic plants or other foods relished by waterfowl, and adequately to protect such refuges from the natural enemies of the birds.

The present lack of Federal funds will not prevent the establishment of migratory-game-bird refuges, if an emergency plan recently proposed by the Biological Survey succeeds. According to this plan, State game and conservation commissions, wild-life organizations, and others interested will provide many hundreds of small marsh and water areas suitable as resting, feeding and breeding grounds for the birds. Their establishment now can tide over the period during which the Federal refuge program is slowed up for lack of funds. The numerous small areas that could be used by the birds may well equal or exceed the total acreage of the larger areas that were on the program for establishment in the next two or three years. By that time it is hoped that the major program can be resumed.

The Izaak Walton League of America is among the non-governmental agencies that have been invited to participate in this extensive conservation enterprise. It contemplates the use of such resources as are available. Instead of waiting until the Government can act, the conservationists of the country are invited to work individually in a common effort to reclaim and create the smaller types of marsh and water areas for the preservation of the game species now so seriously threatened. Many of the breeding and resting grounds that have been taken from the birds year after year with the advance of settlement and industry can in this way be restored. These smaller units, ranging in size from an acre upward, are ideally adapted for development and administration by local groups, and when so administered would supplement the system of large refuges to be established later by Federal and State governments.

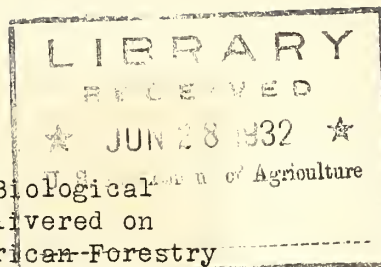
The Izaak Walton League and other organizations and agencies that have representatives in the field may be of the greatest possible aid by encouraging their local agents to foster and direct local operations. It is the purpose to develop the plan immediately in the principal breeding areas in the northwestern United States. An effort will be made to concentrate the initial efforts in this zone, though no opportunities will be overlooked for the establishment of sanctuary areas in other parts of the United States. This is a vitally important region and a successful demonstration of the plan there will not only be of immediate advantage to many migratory birds but will serve to encourage the extension of the plan to other regions. It should permanently supplement the more extensive refuges on the program of the Federal Government.

Federal refuges already established for migratory birds in the Mississippi Valley flyway include the Long Lake Migratory Bird Refuge, in North Dakota; the Upper Mississippi River Wild Life and Fish Refuge, in Minnesota, Illinois, Iowa, and Wisconsin; and the Big Lake Refuge, in northeastern Arkansas.

The Biological Survey plans to extend the number of refuges in the Mississippi flyway as soon as the money becomes available. There are still splendid opportunities both in northern Minnesota and in North Dakota. Missouri contains some important sites, and Arkansas is also a field within which great good can be accomplished. Louisiana and Mississippi also offer some fine refuge opportunities. All these projects, when reduced to realities, will, with other opportunities, of which the Mud Lake refuge will not be least important, and with the supplementary system of smaller refuges, complete a sanctuary system that should contribute greatly to the restoration of the now diminishing waterfowl population of the continent.

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WATER IN RELATION TO BIRD LIFE



An address by Paul G. Redington, Chief of the Bureau of Biological Survey, United States Department of Agriculture, delivered on May 27, 1932, at the 57th annual meeting of the American Forestry Association, held jointly with the Maryland Forestry Association, in Baltimore, May 26-27, 1932

Everyone who is in touch with the wild-bird situation on the North American continent knows full well that ample supplies of uncontaminated water with abundant natural food are a sine qua non to the continued existence of the birds. While in the prairie and desert regions there are some species that are content to make their homes in areas of scanty water, yet even these make regular pilgrimages to the occasional water-holes, springs, or "sinks" that may perhaps furnish the sole supply of water to the animal life of a vast region. Very few species of birds are able to extract from their food the water necessary for their systems. Even in cities, bird students have long known that a copious supply of water in their grounds or yards is as potent an attraction for song and insectivorous birds as an abundant supply of food.

That the existence of many species of our native waterfowl is now seriously threatened, is a matter of common knowledge, and it is also well known that lack of adequate water areas is a prime, if not the chief, reason for this situation. As generally used, the term "waterfowl" refers to ducks and geese, but we should not lose sight of the fact that other birds, interesting and valuable in many ways, share the water habitat of the ducks. Grebes, loons, gulls, terns, pelicans, herons, ibises, rails, blackbirds, native sparrows, warblers, and others are inhabitants of the marshland, so that any factors affecting the environment of the waterfowl, also affect these other members of the avian family.

Since, however, the plight of our waterfowl is so critical, my remarks will be centered chiefly upon them, with the blanket statement just made that the conditions of which I speak concern also many other desirable forms of bird life.

In its final analysis water for waterfowl means just two things--an abundance of it, with freedom from impurities that are detrimental to the health of the birds. Both of these requisites are to-day sadly lacking, owing in part to natural causes but, unfortunately, in a large part to the activities of man through drainage and pollution.

As a nation we have been dealing with our marshland much as we have with a great many other natural resources--acting first and considering the consequences later. The result is millions of acres of drained marshes and lakes, representing in many cases a direct

economic loss to the Nation. The preliminary report of census figures for the year 1930 indicates that the drainage ditch has taken away from our waterfowl, in whole or in part, approximately 77 million acres in the continental United States. There is no question but that some of this attrition of water areas has resulted in the addition of valuable farm lands, but in some regions much of it has been shown up as a rank failure. On literally tens of thousands of acres no success in farming has been achieved and many drainage districts are heavily in debt or are defunct.

Three-fourths of all the land in drainage enterprises in the United States is situated in those States north of the Ohio and Missouri Rivers and east of the Rocky Mountains, including Missouri and Kansas. Roughly speaking, this vast area includes practically all of the waterfowl breeding ranges found in the United States. Included in this region are areas that at one time were justly-famed waterfowl resorts, among which may be mentioned the Kankakee marshes of Indiana, Thief and Mud Lakes in Minnesota, the Montezuma Marsh in New York, Mattamuskeet Lake in North Carolina, and Horicon, Buena Vista, and Trempealeau Marshes in Wisconsin.

The drainage of Lake Kankakee, as the river was formerly known, has resulted in Indiana's now having practically no waterfowl at any time of the year, whereas previous to drainage these marshes literally swarmed with fur-bearing mammals, ducks, geese, and fishes. Each year fur and game products to the value of many thousands of dollars were produced, and the region was a mecca for thousands of sportsmen who made annual visits to the section for the purpose of enjoying the health-giving outdoor sports.

Montezuma Marsh at the foot of Cayuga Lake in New York was originally the home of countless ducks, rails, gallinules, and other water birds, while families living nearby were reported to have realized an income of about \$50,000 annually from the cutting of Cooper's flag or broad-leaved cat-tails. In addition they obtained large sums from the annual crop of fish, fur, and game.

As drainage projects, Thief and Mud Lakes in Minnesota and the Horicon Marsh in Wisconsin were total failures, although vast sums were spent in efforts to convert them into farm land. Through appropriations by the respective State Legislatures, Thief Lake and Horicon Marsh were then bought back and at great expense restored to their former condition and made State game refuges. The restoration of Mud Lake is on the Federal program, but it will require a very large expenditure of funds before the lake can be brought back to the productive condition that existed before the drainage ditch was dug.

Mattamuskeet Lake in Hyde County, North Carolina, was originally known as one of the finest duck and goose lakes on the entire Atlantic seaboard. Actually millions of dollars have been spent in efforts to drain it, and several companies have become bankrupt in the attempts.

In addition to the cases mentioned, innumerable other smaller but important lakes and marshes throughout the entire range of our waterfowl have been despoiled, enriching no one but the promoters and contractors, but depriving the wild life of the continent of important parts of their natural habitat. Even the great marshes at the mouth of the Mississippi River whose fertility has been likened to the delta of the Nile, have been threatened. Already certain portions have been blocked off, advertised and sold in lots, acres, sections, and townships. The floods of the great river, however, will probably effectually prevent undue exploitation of these marshes, but the case illustrates what conservationists of water areas may expect.

In speaking of the disastrous floods of the Mississippi there is cause also for sober thought on the part drainage has played in causing these catastrophes. When we consider the tens of thousands of miles of ditches that have been dug to facilitate the run-off from the continent's greatest watershed, which is accordingly deprived of many of its natural storage lakes and marshes, we have a better understanding of the inevitable floods and the resulting economic loss in life and property.

With the progressive drainage of our lakes and marshes, the waterfowl have been pushed back farther and farther, first in our own country, and then in Canada as the work of the drainage ditch has been accomplished also in the lands of our northern neighbor. In parts of the prairie provinces of Canada, wheat fields have supplanted the natural marsh areas that once were the greatest breeding grounds of some of our most important game species of waterfowl.

The continued drought of recent years has been an instrument that operated for no good to the breeding ducks in Canada and the north central and northwest areas in the United States. Water levels have been lowered to a point where lakes and ponds of long standing have disappeared from the landscape. In many cases where a remnant of the water supplies are still found, but in greatly diminished volume, disease has taken countless thousands of waterfowl. Overshooting of game species during this period has been a potent factor in the general debacle, and the plight of the birds is indeed a sad one.

The Migratory Bird Conservation Act of 1929 gave to the Department of Agriculture an authorization of \$7,875,000 to be used for a marsh- and water-restoration program, and a good start has been made. Fifteen refuges in fifteen different States, totaling nearly 208,000 acres of water and marshland, have been established. Part of the area has been set aside by Executive order but more than 144,000 acres have been purchased at an average cost to the Government of only \$4.54 per acre. But along came the financial crisis, which had to be partially countered by a reduction in appropriations, and the program of Federal restoration is at a standstill and will remain so until brighter times return.

In the meantime the Biological Survey has sent out an appeal to State Game Commissions and to those national organizations interested in the welfare of the ducks and geese to aid in a restoration program by devoting water areas of one acre and upwards to the cause of the waterfowl. The response already has been very generous, and we are hopeful of good results.

The problem of saving our remaining water areas from wasteful destruction and exploitation by unwise and unprofitable drainage schemes can be met by placing in some responsible agency of the Federal Government and of the respective States full power to examine into every important drainage and reclamation proposal that arises for consideration. These agencies should have authority to veto ill-considered plans. This thought is given expression in a measure that is now before Congress, having been passed by the Senate and favorably recommended in the House of Representatives. It is known as Senate Resolution No. 263 and provides that: "Whenever the Federal Government . . . impounds water for any use, opportunity shall be given to the Bureau of Fisheries and/or the Bureau of Biological Survey to make such uses of the impounded waters for fish-culture stations and migratory-bird resting and nesting areas as are not inconsistent with the primary use of the waters and/or the constitutional rights of the States." The passage of this measure will do much to uphold the hands of the Bureau of Fisheries and the Biological Survey in their efforts to conserve water areas.

It is also worthy of note that at the National Conference on Land Utilization, called by Secretary Hyde of the Department of Agriculture, and held in Chicago on November 19, 20, and 21, 1931, the recommendation was made that no further drainage or irrigation projects be undertaken "until they are justified by the agricultural needs of the Nation." This conference further urged and emphatically recommended "that Federal and State agencies develop a coordinate program of land utilization for these extensive areas of idle or misused lands." It also recommended that "extensive areas that are not suited for private utilization or that for one reason or another should be under public ownership and management in order to prevent their misuse or for other reasons," should be so administered.

The question may be raised: "How about the many large reservoirs that have been constructed in the Western States? Surely they present an abundance of water." They do, as rest areas, and several large irrigation reservoirs constructed by the Federal Government are now bird refuges, where ducks and other birds find sanctuary during the hunting season. Almost all of these, however, are deep lakes with rocky or sandy shores, providing little or no food and no marshland for nesting. Such lakes have their uses for the birds but do not in any way replace the drained swamps and marshes that supply both food and cover during the breeding season.

As a summary of the havoc that ill-advised drainage has wrought to the harassed waterfowl I wish all of you might read the chapter on "Drainage and Irrigation" in the book "American Waterfowl" by John C. Phillips and Frederick C. Lincoln. It reviews the entire subject and presents a State-by-State picture of the situation.

It may be stated without fear of contradiction that pollution of many of our finest streams and lakes, adding insult to injury, has depleted fish, waterfowl, and aquatic animal life to a point where but a pitiful remnant of the original population remains. Commissioner O'Malley of the Bureau of Fisheries, who is jointly interested with the Biological Survey in the administration of the Upper Mississippi River Wild Life and Fish Refuge, has most accurate information as to the increasingly bad pollution situation on the Upper Mississippi River. It is an unfortunate fact that as individuals and as organizations, we have come to regard streams and other bodies of water as proper avenues for the removal of any waste material. The Izaak Walton League of America has recognized this situation and through its Divisions and local chapters has used the power of its influence to eradicate pollution.

We have been heedlessly polluting our streams and even defiling the seven seas with the off-scourings of our civilization, and while the pollution of streams and other water areas may result from many causes such as civic and industrial waste, pollution by oil so far overshadows all other types as to relegate them to places of minor importance. If the era in which we live has been called the "Age of Steel," it might with equal significance and propriety be termed the "Age of Oil," for oil in a thousand ways has come to be the driving force behind our contemporary civilization. It is a singular irony of fate, however, that this same oil, a residual deposit from the ancient, vanished life of the earth, should be destined to cause such widespread suffering and destruction to various forms of present-day aquatic and avian life. Driving the wheels of industry, making possible the development of an age of transportation by land, sea, and air, and contributing in many ways to the comforts and refinements of our lives, this same "black gold" when improperly handled or permitted to escape beyond the bounds of our control, is to be reckoned as one of the major destructive agencies to birds, fishes, and other forms of aquatic life.

The chief offenders in this crime against our wild life are oil-burning and oil-cargo vessels, which have been accustomed to fill empty oil tanks with sea water as ballast and to pump out this water and residual oil as they approached their destination. Oil so discharged will film out to an invisible thickness and may drift as much as 100 miles before it finally becomes weighted with atmospheric dust and sinks below the surface. When on the high seas, oil apparently is likely to do very little or no damage, but when released near shore, the effect is frequently disastrous.

In territorial waters oil pollution may originate as leakage from stills, pipe-lines, filling racks at refineries, drydocks and shipyards, public garages, railroad yards, power plants, and many other industrial plants.

When birds alight on an oil-covered water surface they soon find their feathers saturated with the oil and so are unable again to take flight. The fine down which insulates their bodies against cold and water becomes matted and water-soaked, the skin is exposed to the elements so that the birds perish from cold and hunger, while in some instances they are actually drowned. Live birds in this 'oil and water-soaked condition have been rescued, washed clean with soap and water, dried out, and liberated without suffering any apparent ill effects from the experience, but unless human aid is rendered, birds that alight in an oil-covered water area are almost certainly doomed to death.

During the last 15 years many accounts of the destruction of ducks, gulls, loons, and other water birds through the instrumentality of oil, have been reported to the Biological Survey. The areas covered include all coasts, although the worst cases naturally have occurred in the vicinity of the larger shipping centers--Boston, New York, Baltimore, Charleston, Savannah, Los Angeles, San Francisco, and Portland.

To one who has observed at first-hand the tragic picture presented by a beach dotted with dead and dying oil-soaked birds, the infinite pity of it all is enough to arouse such a person to any line of rational remedial action that is calculated to end this abomination. The curse is international, and as a result of the extensive publicity directed against oil pollution a Conference on Oil Pollution of Navigable Waters was held in Washington, D. C., June 8-16, 1926, and participated in by twelve foreign powers. At this conference it was brought out that, while "there has been a marked diminution of oil pollution since attention was first called to it, due both to the action of the governments and to the voluntary cooperation of the interests concerned," nevertheless, "the evil is still serious in some waters and it can only be dealt with satisfactorily by international action." After a thorough discussion and consideration of all parts of the subject, the conference adopted the draft of a convention that provided for the establishment by the respective governments of areas in waters adjacent to their coasts, in which discharge of oil or oily mixtures from vessels (other than war vessels, separately provided for) shall be prohibited.

By 1930 this convention had been tentatively agreed to by nine of the powers represented, but up to the present time the desired multi-power treaty has not been negotiated.

The Federal law, passed and signed by the President in 1924, provides that it shall be unlawful to discharge, suffer, or permit the discharge of oil upon the coastal navigable waters of the United States. Penalties are provided for violations, and the Secretary of War is charged with enforcement, but the difficulties incidental thereto are readily apparent. It appears that the act should be amended to the extent that effective oil separators would be a part of the required equipment of all oil-burning and oil-cargo vessels.

The problem is not confined to the coastal waters but exists to a greater or lesser degree in each State. For example--a break in a pipe line that passed under the Illinois River at Chillicothe released what was estimated as 350,000 barrels of oil, causing the destruction of great numbers of ducks and coots that were then congregated in this famous waterfowl region.

Many States have passed stringent anti-pollution laws, which if vigorously enforced will do much to rectify the deplorable conditions existing in vast areas of coast, river, and marsh. In the measure previously referred to--that is, Senate Resolution Number 263--the Secretaries of Agriculture and Commerce are authorized "to make such investigations as they may deem necessary to determine the effects of domestic sewage, trade wastes, and other polluting substances on wild life, with special reference to birds, mammals, fish, and shellfish, and to make reports to the Congress of their investigations with recommendations for remedial measures." It will thus be seen that the tendency to-day is to realize more and more the great value of our water and marsh areas and of the bird life that is dependent upon them. All birds require drink, and apparently all delight, in varying degree, in frequent bathing. Practically all of these feathered creatures are of direct benefit to mankind. Man enjoys their presence because of their songs, beautiful plumage, interesting habits, or value from the viewpoint of sport and food, and so man should be quick to respond to their simple needs for clean and abundant water.

I very greatly hope that the American Forestry Association and the Maryland Forestry Association, so far as they consistently can, will give aid to the restoration of the water areas suitable for our migratory birds.

